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MONTHLY
MICROCLIMATIC SUMMARY

OCTOBER 1967

ENVIRONMENTAL DATA BASE
FOR REGIONAL STUDIES IN THE HUMID TROPICS

USATECOM Project No. 9-4-0013-01

US ARMY
TROPIC TEST CENTER
Fort Clayton, Canal Zone

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OCTOBER 1967

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USATECOM Project No. 9-4-0013-01

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MONTHLY MICROCLIMATIC SUMMARY

Introduction

Monthly microclimatic data summarized in this series of reports were collected by the US Army Tropic Test Center and the Weather Engineers of Panama Corporation under the project, Environmental Data Base for Regional Studies in the Humid Tropics. The project is sponsored by the Advanced Research Projects Agency of the Department of Defense and by the Army Research Office, Office of the Chief of Research and Development. It is an investigation of microclimatic, air chemistry, vegetation, soils, microbiological, and macrofaunal conditions at selected sites in the principal tropical environments of the Panama Canal Zone and the Rio Hato Military Reservation. The objective of the project is to assemble quantitative environmental data for RDT&E purposes.

Sites. Data summarized in this report were collected at the Albrook Forest and Chiva Chiva sites. Figure 1 shows the site locations within the Isthmus of Panama. Geographic coordinates are shown below:

Albrook Forest	09° 01'N, 79° 33'W
Chiva Chiva	09° 01'N, 79° 35'W

The Chiva Chiva open site and the Albrook Forest site are paired for comparative study of environmental conditions in a tropical semideciduous forest and in a large clearing. Both are located in a region where the annual precipitation is approximately 80 inches and there is a pronounced dry season. The other satellite sites were located primarily for soil studies purposes. Albrook and Fort Kobbe have climatic regimes similar to the principal sites.

The Albrook and Chiva Chiva main sites are approximately four kilometers apart. Each has a 46 meter walk-up tower and an air-conditioned building to house the recording equipment and observers. Both sites are approximately 30 meters above sea level. The top of the forest canopy at the Albrook site is about 26.5 meters above the ground.

Instrumentation. A wide range of climatic elements are measured at the Albrook and Chiva Chiva sites. Types of observations and frequencies are shown on Figure 2. The towers at the Albrook and Chiva Chiva sites are similarly oriented. Sensing equipment is mounted at several levels on the towers to provide measurements through the vertical profile. Additional instruments are emplaced in the immediate vicinity on or near the ground. All instrument exposures are duplicated at each site. Figures 3, 4, and 5 show the instrument array at these sites.

Data Reduction and Storage. All data, as applicable, are recorded at or reduced to each full hour and transposed to punch cards. These punch cards, together with all raw data, are stored in the Tropic Test Center Technical Library Annex.

The relative humidity data contained in this report required some adjustment due to the difficult problems in maintaining hair hygrometers in the humid tropics. The hygrometers show saturation at a time when the psychrometer shows a relative humidity well below 100%. For this reason the hourly measurements made by means of a hair hygrometer have been modified on the basis of simultaneous psychrometer readings of other levels. Details will be given in the fourth Semiannual Report. It can be assumed that the means of relative humidity presented in this volume are very close to the true means.

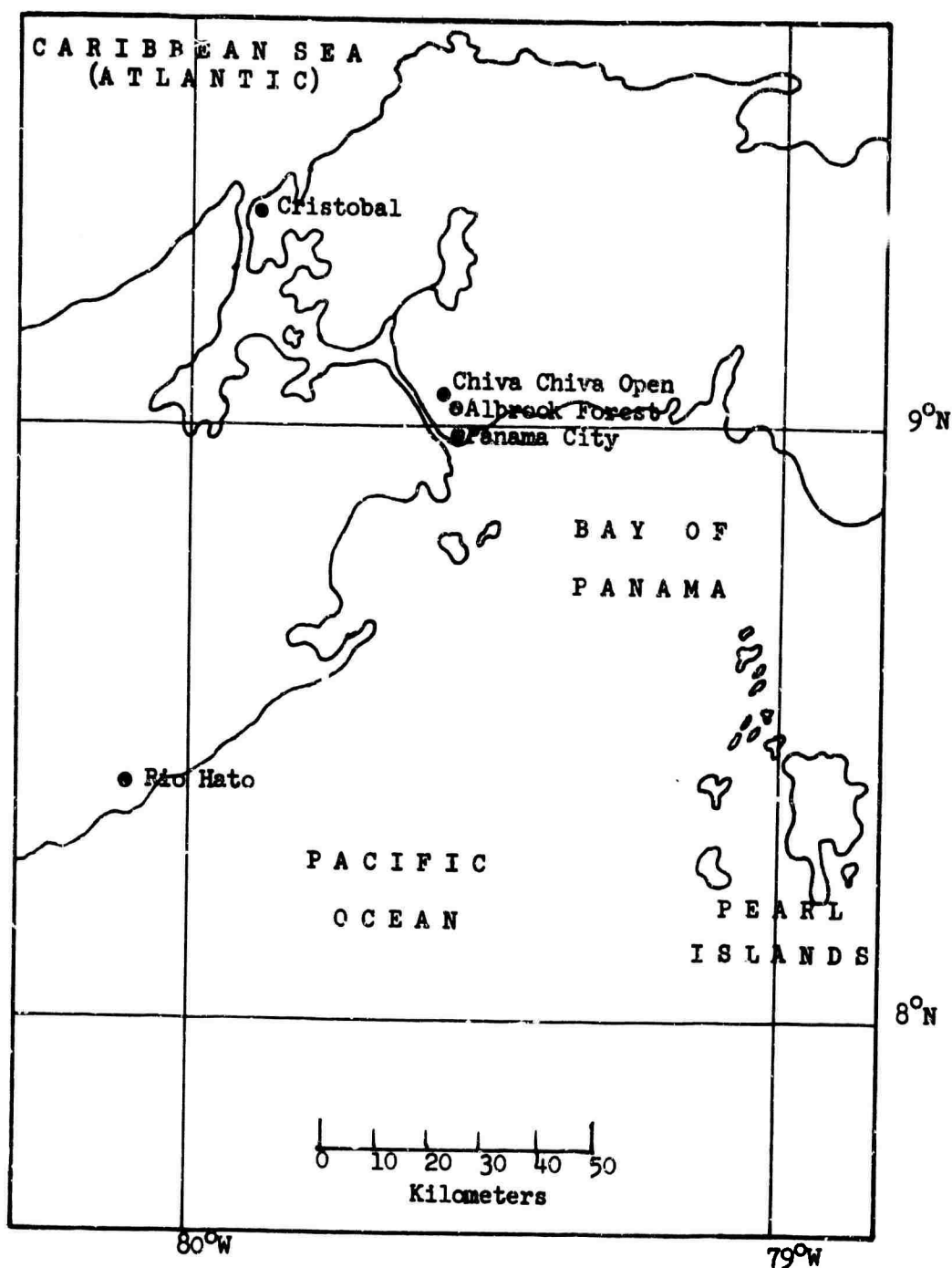


FIGURE 1. LOCATION MAP, ISTHMUS OF PANAMA

FIGURE 2. FREQUENCY OF OBSERVATIONS.

# Element	Sfc	0.5	1.0	2.0	4.0	8.0	13.5	26.5	39.0	46.0	Frequency
<u>Temperature:</u>											
Dry Bulb	-	1	1	2	2	-	1	1	-	1	Hourly*
Wet Bulb	-	1	-	2	2	-	-	-	-	-	Hourly*
Gross Minimum	3	-	-	-	-	-	-	-	-	-	Once Daily
<u>Relative Humidity</u>											
	-	1	2	2	2	-	1	1	-	1	Hourly*
<u>Barometric Pressure</u>											
	-	-	1	-	-	-	-	-	-	-	Continuously
<u>Evaporation</u>											
	-	1	-	-	-	-	2	2	-	2	Once Daily
<u>Precipitation:</u>											
Recording Gage	-	-	1	-	-	-	-	-	-	2	Continuously
Manual Gage	-	-	2	-	-	-	-	-	-	-	4 Times Daily
<u>Wind:</u>											
Direction	-	-	-	-	1	-	-	1	2	2	Continuously
Speed	-	-	-	3	1	-	3	1	-	2	Hourly

1. Albrook and Chiva Chiva
2. Albrook only
3. Chiva Chiva only

* Observations made with sling psychrometer when recorders are inoperative.

Instrument descriptions are contained in the Environmental Data Base Semiannual reports.

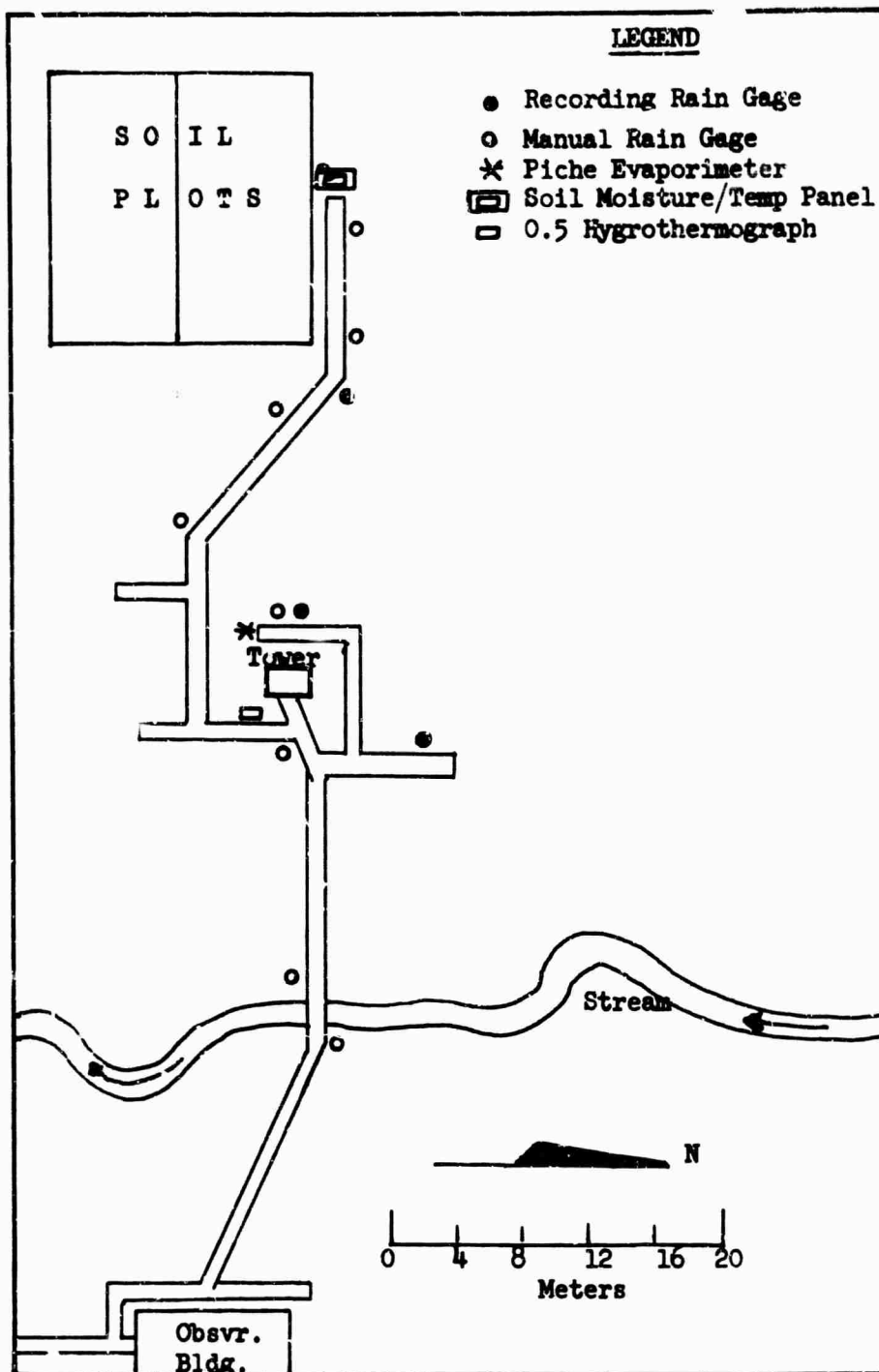


FIGURE 3. ALBROOK FOREST SITE, GENERALIZED PLOT

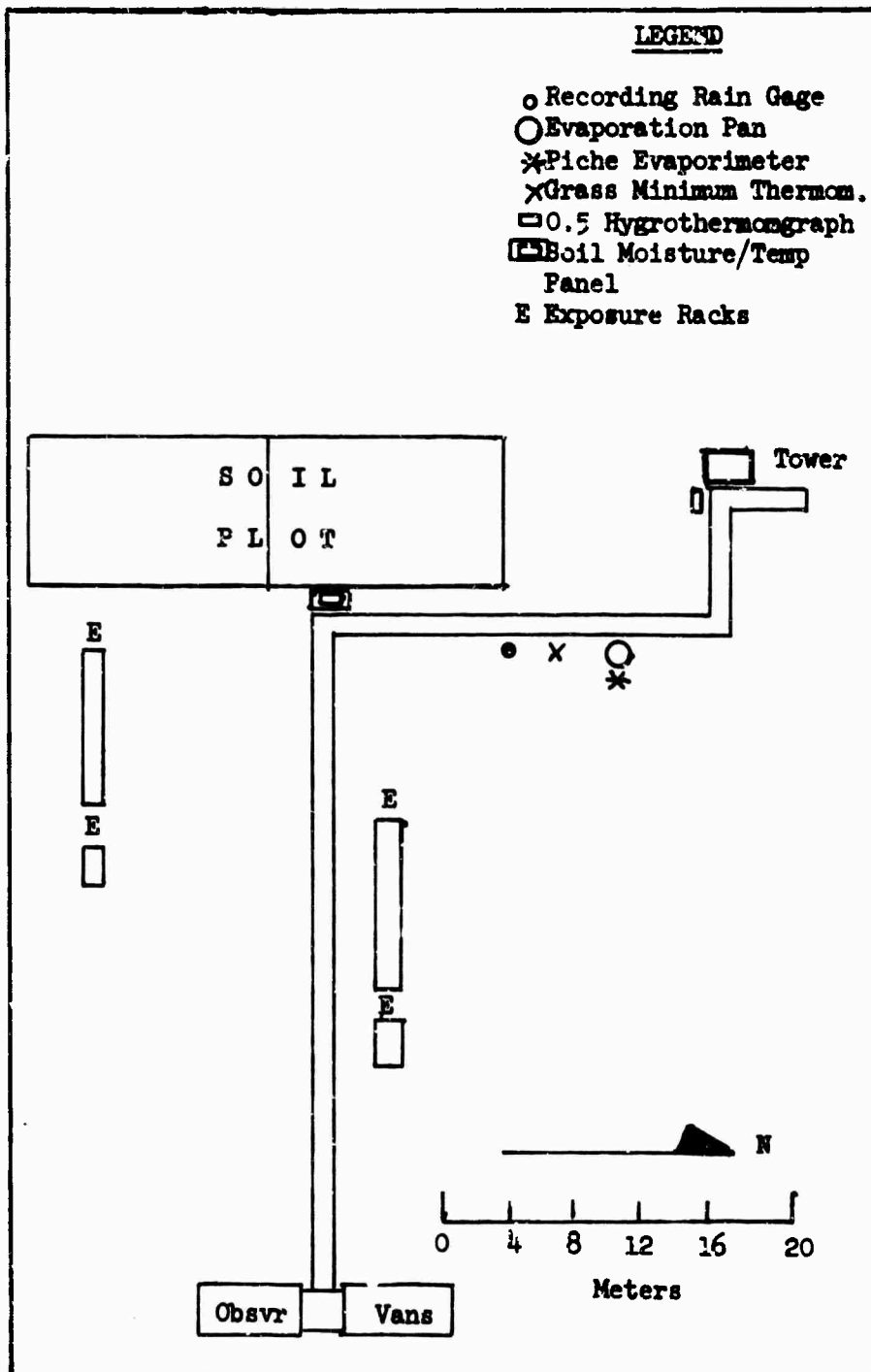


FIGURE 4. CHIVA CHIVA OPEN, GENERALIZED PLOT

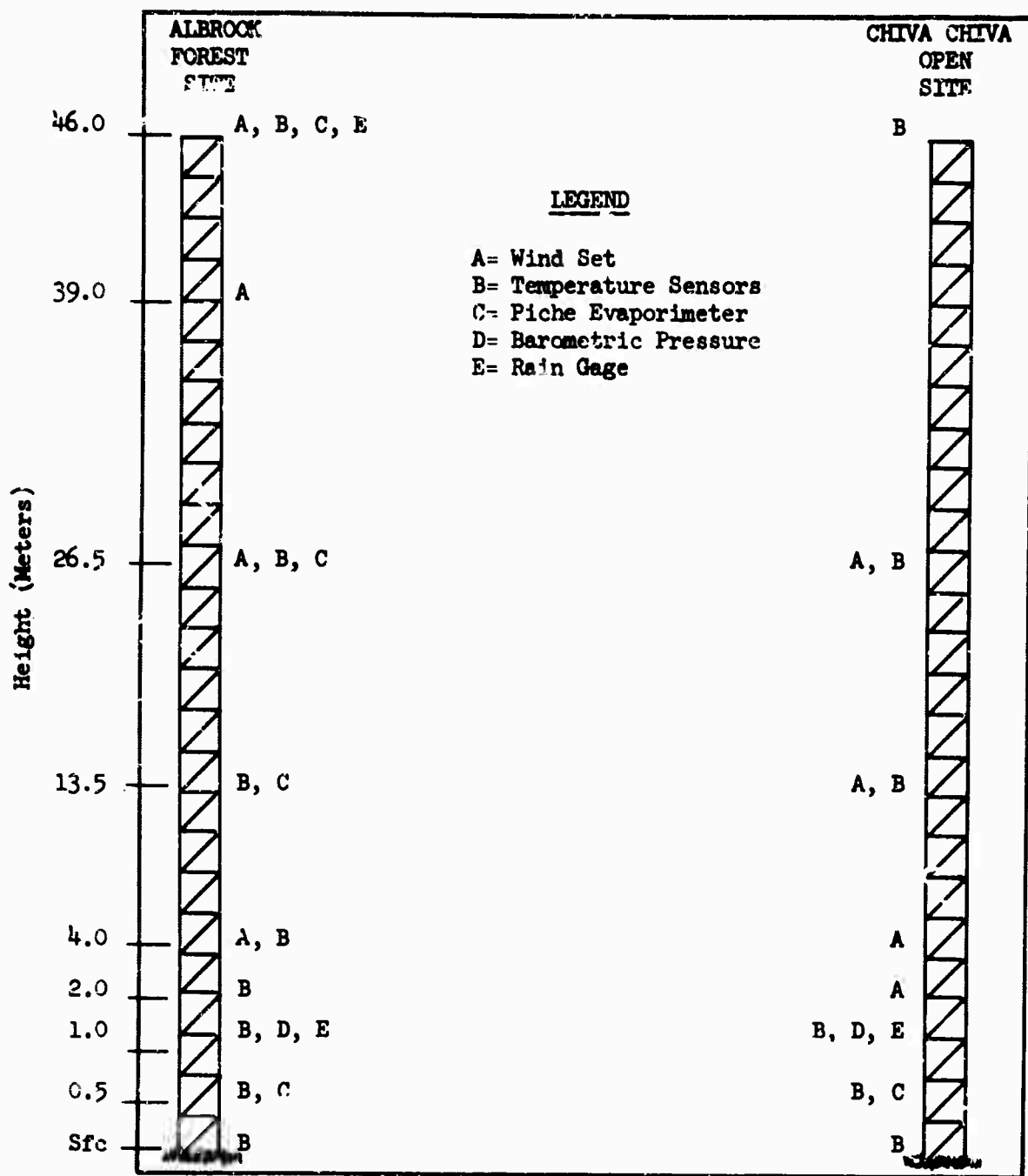


FIGURE 5. INSTRUMENT LOCATION ON TOWERS

SUMMARY OF METEOROLOGICAL OBSERVATIONS

HOURLY DATA

OCTOBER 1967

Exposure	Monthly Means of Air Temperature by Hour (°F)																								Monthly Summary					
	Site	Level	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	No of obs.	Min.	Mean	Max.
Albrook (Forest site)	46.0 m		74.4	74.2	74.0	73.9	73.7	73.7	74.5	76.4	78.9	80.9	82.4	82.2	81.1	79.7	79.0	78.7	77.8	76.8	75.8	75.4	75.1	75.0	74.9	74.7	722	71.3	76.7	86.7
	38.5 m		This level was not instrumented for air temperature at this time																											
	26.5 m		74.0	73.9	73.7	73.7	73.5	73.6	74.6	76.9	79.5	81.5	82.8	83.0	82.0	80.6	79.8	79.3	78.1	76.5	75.4	75.0	74.7	74.5	74.3	74.1	744	71.0	76.9	87.3
	13.5 m		73.8	73.6	73.5	73.4	73.2	73.9	75.8	78.3	80.1	81.4	82.3	81.3	80.2	79.6	79.0	78.1	76.7	75.8	75.2	74.9	74.5	74.4	74.0	742	69.5	75.5	86.3	
	8.0 m		This level was not instrumented for air temperature at this time																											
	4.0 m		73.9	73.8	73.6	73.4	73.3	73.3	74.1	76.1	78.1	79.5	80.4	80.7	79.5	79.1	78.8	78.3	77.4	76.3	75.7	75.2	74.9	74.7	74.5	74.3	720	69.7	76.3	84.3
	2.0 m		73.9	72.8	73.6	73.4	73.3	73.3	74.0	76.0	77.8	79.2	79.9	80.4	79.3	79.0	78.7	78.3	77.5	76.4	75.8	75.3	75.0	74.8	74.5	74.4	720	69.7	76.2	84.0
	1.0 m		74.0	73.7	73.6	73.4	73.3	73.3	74.1	75.7	77.5	78.8	79.6	80.0	79.1	78.6	78.6	78.0	77.4	76.4	75.7	75.2	75.0	74.8	74.5	74.4	721	69.7	76.1	83.3
0.5 m		74.1	74.1	73.9	73.8	73.6	73.6	74.0	75.3	77.0	78.4	79.2	79.8	79.5	78.7	78.6	78.2	77.5	76.6	75.8	75.4	75.1	74.7	74.6	74.3	740	70.2	76.1	82.4	

Chiva Chive (Open site)	46.0 m		73.5	73.3	73.2	73.0	72.9	73.1	73.6	74.8	77.1	79.3	80.5	80.4	79.9	78.8	78.5	77.8	77.0	76.0	75.2	74.7	74.6	74.3	74.0	73.8	743	69.8	75.8	85.2
	38.5 m									This level was not instrumented for air temperature at this time																				
	26.5 m		73.3	73.1	72.9	72.8	72.6	72.6	73.6	75.0	77.0	79.1	80.6	80.4	80.1	79.0	78.7	77.9	77.1	76.0	75.0	74.5	74.2	74.0	73.6	73.4	744	62.3	75.1	85.2
	13.5 m		73.0	72.7	72.6	72.4	72.3	72.3	73.4	74.9	77.3	79.1	80.4	80.4	80.0	79.0	78.6	77.9	77.1	75.9	74.9	74.3	73.9	73.6	73.3	73.0	741	67.8	75.7	86.0
	8.0 m									This level was not instrumented for air temperature at this time																				
	4.0 m									This level was not instrumented for air temperature at this time																				
	2.0 m									This level was not instrumented for air temperature at this time																				
	1.0 m		73.1	73.0	73.0	72.7	72.7	72.5	75.0	78.4	81.8	84.1	85.7	85.1	83.8	81.5	80.6	79.9	78.2	76.2	75.3	74.7	74.2	73.8	73.5	73.3	725	69.0	77.2	93.0
	0.5 m		73.1	73.0	72.9	72.7	72.6	72.5	75.2	78.7	82.3	84.6	86.0	85.5	84.0	81.5	81.2	80.0	78.3	76.2	75.3	74.7	74.2	73.9	73.6	73.4	732	69.0	77.3	96.0

SUMMARY OF METEOROLOGICAL OBSERVATIONS

HOURLY DATA

OCTOBER 1967

Exposure		Monthly Ranges of Air Temperature by Hour (or)																								Monthly Summary *			
Site	Level	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24				
Albrook (Forest site)	46.0 m	3.8	3.7	4.1	4.4	4.7	4.7	3.8	5.8	9.4	11.6	12.7	12.2	11.2	13.3	10.5	10.4	9.0	8.2	6.5	5.4	5.2	5.1	5.1	5.0				
	28.5 m	This level was not instrumented for air temperature at this time																											
	26.5 m	4.0	4.0	4.2	5.0	5.0	4.5	3.6	5.8	8.7	10.4	10.5	11.4	10.4	12.3	10.6	10.3	8.1	6.7	4.9	4.2	3.4	3.7	4.0	4.1				
	13.5 m	6.1	6.2	6.3	7.1	7.4	7.5	5.5	4.5	6.8	9.9	10.9	11.4	9.9	10.8	11.1	9.9	8.6	6.9	6.0	4.9	4.6	4.7	5.3	6.3				
	8.0 m	This level was not instrumented for air temperature at this time																											
	4.0 m	4.9	5.7	6.4	5.8	6.0	5.8	5.6	5.3	6.9	9.8	9.3	9.3	10.1	10.3	9.0	8.0	7.9	5.9	5.2	5.3	5.0	4.4	4.5	4.5				
	2.0 m	4.9	5.9	5.9	5.8	6.1	6.1	4.8	5.3	6.5	9.5	8.7	9.3	10.2	9.3	8.9	7.9	7.3	6.1	5.5	5.3	5.2	4.7	4.9	4.9				
	1.0 m	4.6	5.5	6.1	6.3	6.4	6.3	5.0	5.3	6.4	6.7	7.7	8.5	10.0	8.0	7.8	8.0	6.5	6.1	5.1	4.7	5.7	4.0	5.0	5.5				
0.5 m	6.1	6.6	6.3	6.1	5.9	5.7	4.4	3.6	4.4	5.5	6.7	7.0	8.6	8.2	8.0	7.5	8.1	6.6	5.7	5.5	5.3	5.4	6.2	6.1					

* No monthly summary was computed for the ranges.

Chiva Chiva (Open site)	46.0 m		5.6	6.3	5.6	6.2	6.5	5.9	5.8	7.0	8.4	9.9	10.6	10.7	10.9	11.2	11.9	10.6	9.6	7.8	6.5	6.1	5.3	5.1	4.2	5.0	
	28.5 m		This level was not instrumented for air temperature at this time																								
	26.5 m		6.0	6.0	5.4	6.2	8.0	6.2	6.8	5.6	7.7	8.8	10.2	11.2	11.6	12.2	12.8	10.2	10.4	7.8	6.9	6.3	5.2	5.4	5.6	5.0	
	13.5 m		5.9	7.4	5.8	6.6	8.0	6.7	6.9	6.8	7.9	9.0	10.8	12.1	12.0	12.2	12.8	10.4	10.8	7.5	7.0	6.7	5.6	5.0	5.2	5.2	
	8.0 m		This level was not instrumented for air temperature at this time																								
	4.0 m		This level was not instrumented for air temperature at this time																								
	2.0 m		This level was not instrumented for air temperature at this time																								
	1.0 m		5.0	4.7	5.8	5.8	6.8	7.0	8.5	12.0	14.3	18.8	16.7	15.9	14.8	15.7	12.8	13.2	12.9	7.8	6.8	5.1	5.0	5.3	4.8	4.7	
	0.5 m		4.7	4.5	5.5	5.2	7.0	7.0	9.2	15.2	16.4	22.0	17.5	18.5	18.0	15.9	13.9	13.2	12.9	7.9	6.8	4.9	5.0	5.3	4.8	4.1	

SUMMARY OF METEOROLOGICAL OBSERVATIONS

HOURLY DATA

OCTOBER 1967

Exposure		Monthly Means of Relative Humidity by Hour (%)																								Monthly Summary				
Site	Level	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	No. of Obs.	Min.	Max.		
Albrook (Forest site)	46.0 m	95	95	95	95	95	95	94	92	87	82	78	78	81	84	85	88	88	91	94	94	94	94	94	94	94	586	63	90	97
	28.5 m	This level was not instrumented for relative humidity at this time																												
	26.5 m	96	96	95	96	96	96	95	91	85	81	77	77	80	83	85	87	90	94	95	95	95	95	95	95	707	64	90	99	
	13.5 m	97	97	97	97	97	97	96	94	92	88	86	85	87	89	90	92	93	95	96	96	96	96	96	96	96	706	68	93	99
	8.0 m	This level was not instrumented for relative humidity at this time																												
	4.0 m	97	98	96	98	98	98	97	96	92	90	88	86	89	90	92	94	95	96	97	97	97	97	97	97	97	698	65	95	100
	2.0 m	97	98	97	98	98	98	97	97	93	91	90	88	90	91	93	95	96	97	96	97	97	97	97	97	97	698	72	95	100
Albrook (Forest site)	1.0 m	97	98	98	98	98	98	97	97	96	94	93	92	92	93	94	96	96	97	97	97	97	97	98	97	699	77	96	100	
	0.5 m	97	97	97	97	97	96	96	96	96	94	94	92	92	94	94	95	96	96	97	97	97	97	97	97	741	71	96	100	

46.0 m	96	96	96	97	96	96	96	95	93	88	83	79	80	81	84	86	87	88	91	92	94	94	94	95	95	95	669	60	91	100
28.5 m	This level was not instrumented for relative humidity at this time																													
26.5 m	96	97	97	97	97	97	95	93	87	82	78	78	80	83	84	85	87	90	90	92	94	94	94	95	96	96	741	59	90	100
13.5 m	98	98	98	98	98	98	96	94	88	83	80	79	81	84	85	86	88	91	91	94	95	95	96	97	97	97	739	60	92	100
8.0 m	This level was not instrumented for relative humidity at this time																													
4.0 m	This level was not instrumented for relative humidity at this time																													
2.0 m	This level was not instrumented for relative humidity at this time																													
1.0 m	This level was not instrumented for relative humidity at this time																													
0.5 m	98	98	98	98	98	98	94	88	82	79	77	78	80	83	86	88	91	96	97	97	97	98	98	98	97	97	732	52	91	100

SUMMARY OF METEOROLOGICAL OBSERVATIONS

HOURLY DATA

OCTOBER 1967

Exposure		Monthly Means ² of other Elements by Hour																								Monthly Summary			
SL#	Code ¹	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Ng of Obs.	Min.	Mean	Max.
Albrook (Forest site)	WB (4.0 m)	73.3	73.3	73.1	73.0	72.8	72.8	73.7	75.2	76.3	77.0	77.2	77.3	76.8	76.6	77.0	76.9	76.3	75.4	74.9	74.5	74.2	74.0	73.9	73.7	698	68.5	75.0	80.0
	WB (2.0 m)	73.3	73.3	73.1	73.0	72.9	72.9	73.6	75.2	76.4	77.1	77.5	77.5	77.6	76.8	77.2	77.0	76.4	75.6	75.0	74.6	74.3	74.1	73.9	73.7	698	68.7	75.1	80.6
	WB (0.5 m)	73.5	73.4	73.2	73.1	73.0	72.9	73.2	74.6	76.0	77.2	77.7	78.0	77.8	77.3	77.3	77.0	76.8	75.8	75.1	74.6	74.6	74.1	73.9	73.7	741	66.0	75.2	81.0
	8P	.744	.727	.715	.712	.713	.728	.752	.769	.784	.791	.784	.759	.728	.708	.688	.680	.685	.695	.710	.731	.752	.764	.766	.759	741	.629	.735	.850
	P1	0.01	0.01	0.00	0.04	0.02	0.01	0.02	0.04	0.05	0.12	0.09	0.06	0.18	0.18	0.21	0.16	0.40	0.06	0.02	0.08	0.02	0.09	0.06	0.62	78	0.01	9.44	1.18
	P3	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.05	0.03	0.07	0.05	0.03	0.18	0.21	0.16	0.02	0.21	0.03	0.05	0.03	0.02	0.03	0.12	0.32	51	0.01	5.36	0.87
	P4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.06	0.01	0.30	0.25	0.19	0.03	0.88	0.04	0.02	0.02	0.01	0.01	0.26	0.33	32	0.01	5.77	1.28

Chiva Chiva (Open site)	WB (0.5 m)	72.7	72.7	72.4	72.3	72.2	72.1	73.9	75.7	77.8	79.1	77.7	73.6	79.2	77.4	77.8	77.2	76.3	75.3	74.6	74.1	73.7	73.4	73.1	73.0	732	65.0	75.2	85.0
	8P	.845	.827	.819	.816	.822	.837	.856	.873	.890	.396	.886	.868	.833	.811	.793	.787	.792	.804	.816	.838	.853	.871	.870	.862	739	.730	.840	.960
	PS	0.00	0.00	0.00	0.00	0.04	0.00	0.02	0.12	0.17	0.05	0.03	0.38	0.15	0.25	0.14	0.24	0.50	0.09	0.14	0.06	0.02	0.06	0.21	0.96	84	0.01	15.60	1.93

WB - Wet bulb temperature (°F)
 8P - Barometric pressure (in. of Hg minus 29.0)

PS - Precipitation at 1.0 m. in open area (in.)
 P1 - Precipitation at 46.0 m. above canopy (in.)
 P3 - Precipitation under drip canopy (in.)
 P4 - Precipitation under open canopy (in.)

2 Monthly means of precipitation are computed for precipitation days. Precipitation totals are substituted for the mean in the monthly summary.

SUMMARY OF METEOROLOGICAL OBSERVATIONS

HOURLY DATA

OCTOBER 1967

Exposure	Site Code ¹	Monthly Ranges ² of other Elements by Hour																								Monthly Summary*		
		01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
Albrook (Forest site)	WB (4.0 m)	4.2	4.8	5.5	6.0	7.3	6.3	4.9	4.0	4.3	5.1	5.3	5.5	6.0	6.7	6.9	7.0	7.2	5.4	4.8	4.0	4.0	3.6	3.6	4.0			
	WB (2.0 m)	4.2	5.0	5.5	6.0	7.1	6.3	4.9	3.8	4.4	4.7	5.3	5.0	7.6	6.0	6.9	7.0	7.1	5.7	4.4	4.1	4.2	3.6	3.9	4.0			
	WB (0.5 m)	8.5	8.4	9.1	9.9	10.0	9.3	9.0	6.8	6.2	6.6	6.2	7.0	6.5	6.8	7.0	7.5	7.7	8.5	8.4	8.5	5.2	8.0	8.2	8.2			
	8P	.120	.120	.125	.120	.125	.120	.120	.135	.120	.115	.115	.125	.115	.110	.115	.110	.100	.090	.090	.115	.115	.105	.100	.100			
	P1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.02	0.00	0.09	0.09	0.51	0.87	0.66	0.52	1.17	0.11	0.02	0.16	0.01	0.11	0.00	0.00			
	P3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.02	0.00	0.28	0.86	0.66	0.06	0.81	0.30	0.05	0.53	0.02	0.03	0.00	0.00			
	P4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.03	0.00	0.52	1.27	0.89	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			

* No monthly summary was computed for the ranges.

Chiva Chiva (Open site)	WB (0.5 m)	4.9	4.7	7.0	6.8	10.2	7.0	8.6	9.4	7.4	10.0	8.0	12.0	11.9	9.0	8.8	9.7	7.9	6.0	5.2	3.9	4.3	4.3	4.7	4.3
	BP	.110	.120	.135	.115	.110	.110	.110	.135	.115	.125	.130	.125	.115	.110	.130	.110	.100	.110	.100	.115	.105	.090	.095	.105
	PS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.12	0.05	0.00	1.06	0.49	1.31	0.56	1.04	1.92	0.47	0.30	0.07	0.02	0.14	0.39	0.00

WB - Wet bulb temperature (°F)
BP - Barometric pressure (in. of Hg minus 29.0)

PS - Precipitation at 1.0 m. in open area (in.)
P1 - Precipitation at 46.0 m. above canopy (in.)

P3 - Precipitation under drip canopy (in.)
P4 - Precipitation under open canopy (in.)

² Monthly ranges of precipitation are computed for precipitation days.

SUMMARY OF METEOROLOGICAL OBSERVATIONS

HOURLY DATA

OCTOBER 1967

Exposure	Site	Level	Monthly Means of Wind Speed by Hour (miles/hr.)																								Monthly Summary			
			01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	No. of Obs.	Min.	Mean	Max.
Albrook (Forest site)	46.0 m		3	3	3	3	3	3	4	4	4	5	5	5	5	5	4	4	4	5	4	4	3	3	3	3	698	0	4	13
	28.5 m		This level was not instrumented for wind speed at this time																											
	26.5 m		1	1	1	1	1	1	2	2	3	3	4	4	3	3	3	2	2	2	2	2	2	2	1	659	0	2	10	
	13.5 m		This level was not instrumented for wind speed at this time																											
	8.0 m		This level was not instrumented for wind speed at this time																											
	4.0 m		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	552	0	0	1
	2.0 m		This level was not instrumented for wind speed at this time																											
	1.0 m		This level was not instrumented for wind speed at this time																											
	0.5 m		This level was not instrumented for wind speed at this time																											

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Chiva Chiva (Open site)	46.0 m		This level was not instrumented for wind speed at this time																											
	28.5 m		This level was not instrumented for wind speed at this time																											
	26.5 m		2	2	2	2	2	1	3	5	5	5	5	6	7	6	6	6	6	4	4	3	3	2	3	3	604	0	4	18
	13.5 m		This level was not instrumented for wind speed at this time																											
	8.0 m		This level was not instrumented for wind speed at this time																											
	4.0 m		1	1	1	1	1	1	2	3	4	4	5	6	5	4	5	4	4	2	2	2	2	1	1	1	672	0	3	18
	2.0 m		This level was not instrumented for wind speed at this time																											
	1.0 m		This level was not instrumented for wind speed at this time																											
	0.5 m		This level was not instrumented for wind speed at this time																											

SUMMARY OF METEOROLOGICAL OBSERVATIONS
 HOURLY DATA
 OCTOBER 1967

Exposure		Monthly Ranges of Wind Speed by Hour (miles/hr.)																								Monthly Summary*	
Site	Level	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
Albrook (Forest site)	46.0 m	7	7	6	7	7	6	6	5	5	8	9	13	10	10	11	9	11	8	9	7	8	9	10	8		
	28.5 m	This level was not instrumented for wind speed at this time																									
	26.5 m	5	6	4	5	5	5	5	5	7	7	7	10	9	8	7	7	10	5	7	6	5	8	8	5		
	13.5 m	This level was not instrumented for wind speed at this time																									
	8.0 m	This level was not instrumented for wind speed at this time																									
	4.0 m	0	0	0	0	0	0	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0		
	2.0 m	This level was not instrumented for wind speed at this time																									
Chiva Chiva (Open site)	46.0 m	This level was not instrumented for wind speed at this time																									
	28.5 m	This level was not instrumented for wind speed at this time																									
	26.5 m	7	6	6	4	6	6	8	6	18	6	7	8	13	11	10	18	16	6	8	7	7	6	5	8		
	13.5 m	This level was not instrumented for wind speed at this time																									
	8.0 m	This level was not instrumented for wind speed at this time																									
Chiva Chiva (Open site)	4.0 m	5	5	4	3	3	7	5	6	18	6	9	10	15	11	8	15	15	5	6	6	5	4	4	4		
	2.0 m	This level was not instrumented for wind speed at this time																									
	1.0 m	This level was not instrumented for wind speed at this time																									
	0.5 m	This level was not instrumented for wind speed at this time																									

* No monthly summary was computed for the ranges.

ALBROOK (Forest site) OCTOBER 1967

Relative Frequencies* of Wind Directions by Hour at 46.0 m.

Relative Frequencies* of Wind Directions by Hour at 46.0 m. (%)																								
Dir.	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
N	11.1		11.1						10.0		9.1		9.1						10.0		22.2	14.3		
NNE		11.1				22.2	11.1	30.0					9.1		22.2			10.0		11.1				
NE	11.1				11.1	11.1					9.1	9.1	9.1	9.1							11.1			
ENE							11.1	10.0	10.0						11.1				10.0	11.1		14.3		
E				11.1	11.1	11.1	11.1	10.0	10.0		9.1										11.1		12.5	
ESE								10.0					9.1	9.1	11.1									
SE										10.0	9.1	9.1				11.1								
SSE										10.0	9.1						20.0	10.0					12.5	
S								10.0	20.0	20.0	18.2	36.4	27.3	27.3	22.2	11.1	20.0	10.0	10.0					
SSW			22.2							30.0	9.1			9.1		22.2			10.0			11.1	14.3	12.5
SW	11.1	11.1	11.1	22.2	11.1	11.1			20.0	20.0	18.2	18.2	9.1	9.1	33.3	11.1	40.0	40.0	10.0	11.1	11.1	14.3	37.5	37.5
WSW	11.1	11.1		22.2	33.3	11.1	11.1		10.0	10.0	9.1		18.2	18.2	11.1	11.1	10.0		20.0	11.1	11.1	28.6		25.0
W	11.1	44.4	33.3	11.1	11.1	11.1	11.1		10.0	10.0	9.1		18.2	18.2	11.1	11.1	10.0		20.0	11.1	11.1	14.3		
WNW	11.1			11.1			22.2					9.1				11.1				11.1				
NW		11.1						10.0											10.0	11.1				
NNW							11.1		10.0			9.1		9.1				10.0						
CALM	33.3	11.1	22.2	22.2	22.2	22.2	11.1					9.1						20.0		22.2	11.1		37.5	25.0

• Note: Due to rounding, percentage totals do not equal 100%.

This data represents only the first eleven days of the month. The instrument was removed as of 11 October, 1400 hours.

ALBROOK (Forest site) OCTOBER 1967

Relative Frequencies* of Wind Directions by Hour at 39.0 m. (%)																								
Hr. Dir.	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
N						10.0	5.0		5.0	10.5				10.0	4.8	9.5		4.8		4.8			4.8	4.8
NNE				10.0				5.0		5.3			5.3	5.0				4.8			9.5		9.5	9.5
NE		5.0	5.0	5.0		10.0								5.0						4.8			4.8	4.8
ENE					5.0	10.0	10.0		5.0						4.8		4.8			4.8				
E					5.0	5.0	5.0	5.0	5.0				5.3	5.0	4.8					4.8		9.5		
ESE								5.0	5.0		5.3		5.3				4.8						4.8	
SE								5.0	5.0	5.3		5.3					4.8					4.8		
SSE											5.3	5.3	5.3											
S	10.0			5.0					5.0	36.8	42.0	52.5	42.0	30.0	38.1	28.6	23.8	9.5	9.5				4.8	9.5
SSW	25.0	5.0	5.0	10.0	15.0		5.0	5.0	10.0	10.5	21.0	10.5	5.3	10.0	4.8	9.5	19.0	33.3	14.3	14.3	19.0	9.5	9.5	
SW	20.0	25.0	40.0	20.0	20.0	10.0	15.0	30.0	15.0	5.3	15.8	10.5	10.5	15.0	14.3	23.8	19.0	19.0	19.0	19.0	14.3	28.6	28.6	19.0
WSW	20.0	10.0	15.0	15.0	30.0	20.0	20.0	20.0	20.0	10.5	10.5	5.3		5.0		4.8	14.3	14.3	14.3	14.3	19.0	9.5	9.5	28.6
W	10.0	15.0	15.0	20.0	10.0	25.0	20.0	20.0	5.0			10.5	10.5	10.0	4.8	9.5		9.5	33.3	19.0	19.0	9.5	19.0	9.5
WNW		10.0	15.0	5.0	5.0	10.0	5.0		10.0	5.3					4.8	4.8	4.8			4.8	4.8			
NW	5.0	20.0		5.0	10.0		5.0		5.0	5.3			10.5		19.0	4.8	4.8		4.8	9.5	14.3	9.5		
NNW		10.0					10.0	5.0	5.0	5.3				5.0		4.8			4.8					
CALM	10.0		5.0	5.0										5.0		4.8			4.8			14.3	4.8	14.3

* Note: Due to rounding, percentage totals do not equal 100%.

This data represents only the last 20 days of the month.

The instrument was installed as of 11 October, 1500 hours.

ALBROOK (Forest site) OCTOBER 1967

		Relative Frequencies* of Wind Directions by Hour at 26.5 m. (%)																							
Hr.	Dir.	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
	N	12.0	20.0	16.0	12.0	4.0	12.0	4.0	3.8	3.8	4.1			8.0	7.7	16.0	20.0	3.8	19.2	23.1	4.0	12.0	4.5	4.1	8.3
	NNE			4.0				8.0		7.7	4.1		4.0		7.7	4.0	4.0	3.8	3.8		8.0	8.0			4.1
	NE					4.0			7.7	3.8				8.0	7.7	4.0	4.0	3.8			4.0		4.5	8.3	
	ENE		4.0				4.0												7.7		4.0				
	E			8.0	4.0		8.0	4.0						4.0		4.0	4.0	7.7							
	ESE								7.7	15.4				8.0					3.8			4.0	4.5		
	SE	4.0						7.7	3.8			12.0	4.0	4.0	3.8	8.0		3.8							
	SSE									7.7	4.1	4.0	8.0	4.0	3.8		4.0		3.8						
	S	4.0	4.0			4.0					12.4	24.0	44.0	32.0	30.8	20.0	24.0	7.7		3.8	4.0			4.1	4.1
	SSW				4.0					3.8	4.1		4.0	8.0				11.5		3.8					
	SW							8.0	3.8		4.1	12.0		4.0	3.8	4.0	4.0	3.8			4.0				
	WSW										8.3	8.0			3.8	8.0	8.0	7.7	7.7		4.0	4.0	4.5		
	W	4.0		4.0	4.0				7.7	3.8	16.6		4.0		11.5	4.0	4.0	7.7	7.7		4.0		4.5	4.1	
	WNW	8.0		8.0	4.0		4.0	8.0	7.7	15.4	8.3	12.0	8.0						11.5		8.0	4.0		8.3	
	NW	8.0	8.0		8.0	12.0		16.0	19.2	15.4	8.3		4.0		7.7	12.0	8.0	23.1		34.6	8.0	24.0	22.7	16.6	12.4
	NNW	4.0	16.0	12.0	16.0	24.0	20.0	12.0	11.5	3.8	12.4	12.0	12.0	16.0	7.7	8.0	8.0	7.7	11.5	7.7	20.0	8.0	13.6	4.1	12.4
	CALM	56.1	48.0	48.0	48.0	51.9	51.9	40.0	23.1	15.4	12.4	16.0	8.0	4.0	3.8	8.0	8.0	7.7	23.1	26.9	32.0	32.0	40.8	49.9	58.1

* Note: Due to rounding, percentage totals do not equal 100%.

This data represents only the first 27 days of the month.

The instrument was removed as of 27 October, 1200 hours.

10/28/67, B. A. 0428

ALBROOK (Forest site) OCTOBER 1967

		Relative Frequencies* of Wind Directions by Hour at 4.0 m.																							
		(%)																							
Dir.	Hr.	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
N				4.0					7.7						4.0		4.0					4.0	8.3		
NNE						8.0					4.1					4.0	4.0		3.8	7.7		4.0		4.1	4.1
NE	4.0								3.8					4.0			4.0		3.8			4.0			
ENE	4.0	8.0																11.5		7.7					
E					4.0	4.0	4.0			3.8				4.0					3.8						
ESE							1.0	4.0		3.8	4.1		1.0			4.0									
SE	4.0										4.1		8.0			8.0			3.8		4.0	4.0			
SSE														1.0											
S	4.0	4.0	8.0															3.8						8.3	4.1
SSW					4.0																				
SW											4.1						4.0		3.8			4.0		4.1	
WSW									3.8																
W																	4.0				4.0				
WNW				4.0	4.0								4.0				4.0			3.8		8.0	4.1		4.1
NW		4.0														4.0			3.8	3.8					
NNW		4.0	4.0					8.0										3.8							
CALM	84.0	80.0	84.0	84.0	84.0	84.0	84.0	88.0	105.6	84.8	83.0	100.0	84.0	88.0	92.0	80.0	76.0	76.9	73.1	30.8	80.0	80.0	78.9	74.7	74.7

* Note: Due to rounding, percentage totals do not equal 100%.
This data represents only the first 27 days of the month.
The instrument was removed as of 27 October, 1200 hours.

CHIVA CHIVA (Open site) OCTOBER 1967

		Relative Frequencies* of Wind Directions by Hour at 26.5 m. (%)																							
Dir	Hour	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
N		4.0		7.9	4.0	12.0	12.0	7.9	7.9	24.1	4.0	8.6		4.0	4.0	12.0	16.7	12.0	7.9	12.0		4.0	12.0	7.9	7.9
NNE		4.0	7.9			4.0	4.0		4.0	7.9				4.0	4.0	4.0				7.9	4.0		4.0	7.9	
NE				4.0			4.0	4.0	7.9				4.5	4.0	4.0						4.0		7.9		
ENE				4.0								8.6	4.5		4.0	4.0						4.0			
E					4.0		4.0		4.0		4.0		4.5	7.9	4.0						4.0	7.9	4.0	4.0	
ESE											7.9	13.1		4.0	4.0	4.0	4.1				4.0				
SE										4.0	7.9		8.1	4.0		4.0	4.1	7.9							
SSE			4.0	4.0						4.0				4.0		12.0	12.5	4.0	4.0	4.0			4.0		
S					4.0					16.0	20.0	26.2	27.4	24.1	32.0	12.0	8.3	16.0	4.0					4.0	7.9
SSW	4.0															4.0								4.0	4.0
SW	4.0										4.0				4.0		4.1			4.0			4.0		
WSW	4.0			4.0	4.0			4.0			4.0	8.6	9.1			4.0	4.1		4.0	4.0					
W			4.0	4.0	16.0	4.0	12.0				7.9	4.3	4.5	4.0				16.0			4.0		7.9	7.9	7.9
WNW	20.0	7.9	4.0	4.0	16.0	28.0	7.9		12.0	7.9	4.0		9.1	12.0	24.1	7.9	12.5	7.9	32.0	12.0	28.0	16.0	4.0	28.0	16.0
NW	12.0	16.0	12.0	15.0	24.1	7.9	12.0	12.0	32.0	24.1	16.0	13.1	22.7	16.0	12.0	28.0	12.5	28.0	32.0	44.0	16.0	28.0	24.1	24.1	32.0
NNW	16.0	24.1	20.0	12.0		16.0	20.0	7.9	7.9	4.0	20.0	17.4	4.5	7.9	4.0	4.0	16.7	7.9	7.9	4.0	12.0	24.1	7.9		7.9
CALM	32.0	36.0	36.0	24.1	24.1	32.0	52.0	24.1	7.9					4.0			4.1		7.9	7.9	20.0	16.0	20.0	12.0	16.0

* Note: Due to rounding, percentage totals do not equal 100%

CHIVA CHIVA (Open site) OCTOBER 1967

		Relative Frequencies* of Wind Directions by Hour at 4.0 m. (%)																							
Dir	Hr	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
N		3.2	3.2	6.4	3.2	19.4	12.9	3.2	6.4	16.1	9.7	6.4		3.2		3.2	12.9	6.4		3.2	3.2	3.2	16.1		
NNE		6.4	3.2		12.9	6.4	6.4	3.2	3.2	3.2					3.2	3.2		6.4		6.4	3.2	9.7	6.4		6.4
NE		9.7	3.2	6.4	9.7	6.4	6.4	3.2	9.7			3.2	3.2	3.2	6.4					3.2	6.4	6.4	6.4	3.2	6.4
ENE		6.4	9.7	3.2		3.2		3.2					3.2	3.2		3.2			3.2	3.2		6.4			3.2
E			3.2			3.2	3.2		3.2		3.2	3.2	6.4	3.2	3.2	3.2		3.2					3.2	3.2	3.2
ESE						3.2				3.2	6.4			3.2		3.2	6.4			9.7	3.2				3.2
SE			3.2						6.4	5.2	3.2	9.7	9.7	9.7	3.2		9.7	6.4	3.2		3.2	3.2	3.2	3.2	
SSE		3.2		6.4	3.2					3.2				3.2		6.4	3.2	3.2					3.2	3.2	3.2
S		3.2					6.4	9.7	3.2	16.1	22.6	29.0	22.6	22.6	35.5	29.0	9.7	12.9	9.7	3.2		3.2	3.2		3.2
SSW							3.2				3.2										3.2		6.4		3.2
SW		3.2		3.2	3.2				3.2		6.4	6.4	3.2		3.2		3.2	3.2	3.2	6.4	6.4	3.2	9.7	3.2	3.2
WSW			3.2	3.2	6.4		6.4						3.2			3.2	6.4	6.4	9.7		9.7	3.2	3.2	6.4	
W		3.2		3.2	6.4	6.4		3.2	12.9	12.9		3.2	16.1	6.4	12.9	6.4	3.2	3.2	10.1		12.9	3.2		12.9	6.4
WNW		9.7	3.2	3.2	3.2	6.4	6.4	3.2	12.9	6.4	9.7	9.7	3.2	6.4	6.4	6.4	6.4	16.1	3.2	16.1	6.4	9.7		3.2	6.4
NW		9.7	10.1	12.9	12.9	3.2	3.2	16.1	6.4	9.7	12.9	9.7	9.7	16.1	12.9	16.1	12.9	19.4	25.8	19.4	9.7	12.9	3.2	9.7	12.9
NNW		3.2	9.7	9.7		6.4	9.7	3.2	3.2	6.4	9.7	3.2	3.2	9.7	3.2	6.4	16.1		12.9	6.4	9.7	12.9		6.4	6.4
CALM		38.7	41.9	41.9	22.6	35.5	35.5	51.6	29.0	19.4	16.1	12.9	16.1	9.7	9.7	9.7	9.7	12.9	12.9	22.6	19.4	22.6	35.5	41.9	35.5

* Note: Due to rounding, percentage totals do not equal 100%.

TABLE NO. 2. A 1915

SUMMARY OF NON HOURLY DATA

OCTOBER 1967

Summary of Elements with Non-hourly Frequencies of Observation						
Site	Element, Units and Exposure	Description	Number of Obs.	Minimum Value	Mean or Total Value	Maximum Value
Albrook (Forest site)	Evaporation ³ (In. at 4 levels)	Piche (46.0 m)	27	0.018	4.044*	0.238
		Piche (26.5 m)	27	0.012	2.823*	0.183
		Piche (13.5 m)	25	0.006	1.024*	0.104
		Piche (0.5 m)	13	0.006	0.335*	0.055
	Precipitation from Raingauge Network ² (In. at 1.0 meters)	Gauge # 1	35	0.01	6.32*	1.41
		Gauge # 2	40	0.01	10.53*	1.71
		Gauge # 3	40	0.01	9.50*	1.68
		Gauge # 4	39	0.01	10.12*	2.42
		Gauge # 5	34	0.01	7.78*	1.58
		Gauge # 6	40	0.01	8.42*	1.35
		Gauge # 7	38	0.01	10.19*	2.16
		Gauge # 8	35	0.01	8.16*	1.33
Chiva Chiva (Open site)	Evaporation ³ (In. at 0.5 meters)	Piche	28	0.006	2.480*	0.201
		Pan	28	0.015	4.259*	0.448
Chiva Chiva (Open site)	Minimum Grass temp ³ (°F at grass tips)	None	21	65.0	70.0	74.0

3 - Daily observations
2 - Six hourly observations

* Total Values

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13. ABSTRACT

This report contains detailed microclimatic data for October 1967 from specific sites in the Panama Canal Zone and vicinity. The data are presented in tabular form, summarized for hourly and/or daily observations from surface to 46-meter levels. Elements listed are: temperature, pressure, precipitation, wind speed and direction, relative humidity, and evaporation.

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